THE EFFECTS OF MENTAL PREPARATION ON THE MOTOR PERFORMANCE OF RUGBY PLAYERS OF VARYING TRAIT ANXIETY LEVELS

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D.G. Purdon
University of Canterbury
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TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

ABSTRACT

This study was designed to test the effects of mental preparation and trait anxiety level on the motor performance of a group of rugby players. The Sport Competition Anxiety Test (Martens, 1977) was administered to subjects to assess their trait anxiety levels, and a proportion of these subjects performed two experimental tasks consisting of a strength task and a running speed and skill task. Mental preparation was found to significantly increase motor performance of low and medium trait anxiety subjects in the running task, but had no effect on the strength task. For the high trait anxiety group there were no differences due to mental preparation in the running task but motor performance was significantly worse in the strength task. It was concluded that the difficulty and unfamiliarity of the strength task was itself a source of arousal, and that when coupled with mental preparation arousal was above the optimum and motor performance did not improve. The implications for coaches and players of all sports are discussed, and suggestions made for producing optimal performance through pre-competitive mental preparation.

CHAPTER 1

INTRODUCTION

In individual and team sports the world over mental preparation or "psyching-up" plays an important role in pre-competitive arousal and motivation. Mental preparation can be defined as a cognitive process which aims at preparing an individual for maximum performance.

It is widely believed that pre-game mental preparation enhances performance by raising an athlete's physical and mental readiness to an optimal level. However, despite the widespread acceptance of the facilatatory effect of mental preparation on motor performance there is little research evidence to support this assumption, and even less examining the extent to which any effect varies across individuals and tasks.

The term "mental preparation" is a broad concept covering a range of preparatory techniques. The most commonly identified mental preparation strategies are:

Mental rehearsal or imagery - imagining oneself performing the task to the best of one's ability.

Attentional focus - narrowing thoughts and concentration specifically onto the task at hand.

Preparatory arousal - emotionally "charging up" by becoming

angry or aggressive or aroused in order to increase adrenalin flow and ready the body for physical exertion.

Self-efficacy statements - repetitively reassuring and encouraging oneself into believing one can perform the task proficiently.

Relaxation - relaxing body and mind, sometimes aided by slow, deep breathing.

Most athletes have their own preferred techniques developed through experience which may employ one or more of the above strategies.

Although athletes may employ similar mental preparation strategies any consequential effects on their performance may vary. The prime example of this is a team which uses a group preparatory technique to motivate the individual members. Personality traits exist in individuals in differing intensities and therefore a common mental preparation strategy may effect each team member's behaviour or performance in totally different ways.

One individual difference which can effect sports performance is an individual's trait anxiety level. Trait anxiety can be defined as "a motive or acquired behavioural disposition that predisposes an individual to perceive a wide range of objectively non-dangerous circumstances as threatening and to respond to

these with state anxiety reactions disporportionate in intensity to the magnitude of the objective danger." (Spielberger 1966.) State anxiety is a subjective feeling of apprehension and tension reflecting how anxious the individual is at any one moment, rather than how anxious he or she is generally.

Despite the empirical attention trait anxiety level has received in the literature no studies to date have attempted to determine whether the effect that mental preparation has on performance varies according to an individual's trait anxiety level. It is the purpose of this study to investigate this proposition and also to ascertain whether any effects produced vary according to the type of task being performed.

This thesis begins with a review of the current literature on mental preparation and motor performance, followed by a review of trait anxiety level and motor performance research, including Spielberger's theory of trait anxiety. It then outlines the rationale for the present study and explains the experimental procedure and method employed. Results are then presented and subsequently examined in the Discussion section. Finally a Conclusion outlines the implications of this study's finding for sports' coaches and individuals.

CHAPTER 2

LITERATURE REVIEW

2.1 General Introduction

Research in the area of mental preparation and indeed sports psychology generally has only appeared in any abundance since the late 1960's. The review which follows outlines research involving mental preparation and its effect on motor performance, and then looks at studies which have investigated the influence of trait anxiety level on the performance of motor tasks.

2.2 Mental Preparation and Motor Performance

To date there is some preliminary evidence corroborating the hypothesis that cognitive thought patterns and imagery may influence athletic performance (Corbin, 1972; Mahoney, 1978; Morgan, 1972; Richardson, 1967). This evidence is still very superficial however and the role of specific cognitive skills in sports remains to be clearly elucidated.

The first study which tried to identify the specific effect of mental preparation on the performance of sportsmen was by Shelton & Mahoney (1978). These researchers designed a study to explore the nature and impact of cognitive skills employed by weight lifters during competition. Volunteer subjects were randomly assigned to either an experimental or control group. After baseline assessment of strength, experimental subjects

were asked to use their favourite mental preparation strategy as a means of improving their performance on a hand dynamometer strength test. Control subjects were urged to strive towards improving their performance but were instructed not to specifically mentally prepare themselves. To minimize the effects of "spontaneous (unrequested) psyching", control subjects were asked to engage in a distracting task in which they counted backwards in sizes from a four digit number. The results showed that those who mentally prepared themselves showed significantly better strength performance than subjects who did not.

The effect of mental preparation on motor performance has also been found to vary according to the task being performed. Weinberg, Gould & Jackson (1980) investigated the effect of mental preparation on 3 different tasks: 1) a leg strength task performed on a Cybex Orthotron #7120 - a task requiring a seated subject to forcefully extend a bent leg which is pushing against a footplate set at a specific resistance; 2) balancing on a stabilometer - a task requiring a subject to stand on a centrally balanced board without either end of the board touching an electronic latency counter mounted at ground level; 3) a speed of movement ball snatch task, requiring a subject to react to a stimulus and snatch a tennis ball suspended in front of the subject.

Again subjects were divided into an experimental group required to mentally prepare themselves before performance, and a control

counting backwards group. Results indicated that mental preparation facilitated performance on the leg strength task but had little effect on performance of the balancing task and the speed of movement/ reaction task.

Caudill, Weinberg & Jackson (1983) found that mental preparation aided performance of college sprinters and hurdlers. In this experiment each subject performed under both a mental preparation and control condition. Under mental preparation they were given one minute to prepare themselves (a common interval between the starter's commands and the firing gun). In the control condition the experimenter talked to the subject for one minute prior to the start. The results showed that mentally prepared subjects ran faster times than when they had no cognitive build-up.

This finding may appear contrary to previous evidence (Weinberg et al., 1980) which suggested that mental preparation did not improve speed-of-arm-movement performance. However Caudill et al. point out that although both involve speed, the reaction time task used by Weinberg et al. is a task requiring fine muscle control and co-ordination, whereas the sprinting task used by Caudill et al. involves motor performance of a more gross nature.

Some researchers in conjunction with their main experiment have sought to ascertain the content of their subjects' mental preparation strategies (Shelton & Mahoney, 1978; Weinberg et al., 1980). Due however to subjects often indicating the use of more than one preparatory technique, analyses of the differential effects particular

strategies have had on performance have not been undertaken thus far.

One group of researchers avoided this problem by testing each subject's performance in each of five different mental preparation conditions (Gould, Weinberg & Jackson, 1980). Their performance in each condition on a dynamic leg strength task was compared, and showed that preparatory arousal and imagery elicited significantly greater strength performance than attentional focus, rest and counting backwards.

It is interesting to note that other research has found attentional focus to be the most widely used mental preparation technique among weight lifters (Shelton & Mahoney, 1978) and among college students (Weinberg et al., 1980). More research is needed to identify which mental preparation technique is most beneficial for various motor activities.

Other research has examined the relationship between the length of time spent in mental preparation and performance on a leg strength task (Weinberg, Gould & Jackson, 1981). No significant difference in performance was found between a 15 second mental preparation interval, a 30 second interval and an interval of unlimited duration, but all mental preparation conditions produced significantly better performance than did a control counting backwards condition.

In summary, the small research literature indicates that mental preparation increases strength performance and sprinting performance but does not facilitate reaction time or balancing performance. These results support the hypothesis that a high level of arousal is essential for optimal performance in gross motor activities involving strength, speed and endurance, but interferes with performance involving fine muscle movements, co-ordination, steadiness and general concentration (Oxendine, 1970).

2.3 Trait Anxiety and Motor Performance

Research has also attempted to determine what variables mediate or modify the arousal/performance relationship. One mediating factor which has received attention by researchers is an individual's trait anxiety level.

Trait anxiety theory (Spielberger, 1966) predicts that persons who are high in trait anxiety respond with greater amounts of arousal than persons who are low in trait anxiety to evaluative situations. The potential influence of trait anxiety level on the arousal performance relationship is as follows: because high and low trait anxiety individuals respond with different amounts of arousal to identical stress situations, these different levels of arousal should lead the two groups to perform differently in similar settings. Specifically, the theory predicts that low trait anxiety subjects will perform better after a stressful experience than after a non-stressful experience, whilst high trait

anxious subjects would perform better after a non-stressful experience than after one in which they were stressed.

Differences in the task performance of high and low trait anxious individuals are most often found under conditions of failure or ego involvement (Spence & Spence, 1966), or under circumstances which involve risk of failure (Mandler & Sarason, 1952). These findings may account for some previous negative results where researchers did not employ a stressor in investigating the effect of trait anxiety level on performance (e.g. Hollingsworth, 1975; Matarazzo & Matarazzo, 1956; Thirer & O'Donnell, 1980).

Other studies employing threat of electric shock as a stressor variable also failed to find any differences between trait anxiety groups on response time performance (Farber & Spence, 1956; Kamin & Clark, 1957; Nash, Phelan, Demas & Bittner, 1966) and on a tracking task (Martens & Landers, 1970). The reason for these negative results may be that the threat of electric shock does not produce differential reactions in individuals differing in trait anxiety (Katin, 1965; Hodges & Spielberger, 1969). Weinberg & Ragan (1978) have therefore argued that these negative results are due to the type of stressor employed, as this appears to be the major factor differentiating the experimental designs of the research cited above from the designs of other researchers whose results have supported trait anxiety theory.

A considerable number of studies have found positive results supporting trait anxiety theory (e.g. Hodges & Spielberger, 1969;

Katchmar, Ross & Andrews, 1958; Lucas, 1953; Sarason, 1957, 1961, 1968; Weinberg 1978, 1979; Weinberg & Hunt, 1976; Weinberg & Ragan, 1978; Weiner, 1966; Weiner & Schneider, 1971).

The basic research designs employed by these investigators have been similar. Firstly, groups of low and high trait anxious subjects are selected on the basis of scores attained on the Taylor Manifest Anxiety Scale (Bendig, 1956), or the Trait Anxiety Inventory (Spielberger, Gorusch & Lushene, 1970). Subjects then perform a designated task. Half of the subjects within each anxiety group are then given feedback indicating success on the task while the other half are given feedback indicating that they have failed. All subjects then perform the task again and the pre-feedback and post-feedback scores for each anxiety group are compared.

Results generally indicate that the performance of low trait anxiety subjects decreases after non-stressful success experiences, but increases after psychologically stressful failure experiences. Conversely, high trait anxiety subjects exhibit relative increases in performance after non-stressful experiences but display decreases in performance after psychologically stressful experiences. The implication is that a low degree of stress or arousal should be imposed on high trait anxious individuals if maximum performance is desired. Conversely, low trait anxious individuals perform best when they are stressed and so a high degree of pre-task arousal is desirable.

2.4 Rationale

The present study was designed to test motor performance of rugby players in a strength task and a speed task under two conditions: one, a 30 second mental preparation interval; and two, a control counting backwards condition. Previous research suggests that performance in the mental preparation condition would be better than performance in the control condition, and the effect would be similar for both a strength task and a sprinting task. The present study was also designed to investigate the presence of a trait anxiety by mental preparation interaction. Would mental preparation differentially affect those differing in trait anxiety level? As indicated above there is increasing evidence that trait anxiety level interacts with stress and arousal. The major question addressed by this research is, does trait anxiety level interact with arousal induced by mental preparation?

Rugby players were chosen as subjects as rugby is a sport which places major emphasis on mental preparation by individuals and teams and therefore subjects would be familiar with arousal techniques. The author himself is also a practising rugby player and consequently has an inherent interest in the game and the motivational influences on playing performance. The authors heavy involvement in rugby also meant that subjects were readily available.

Thus the primary purpose of this study was to investigate the effect mental preparation would have on motor performance and to determine if any such effect would vary according to a subject's

trait anxiety level.

A secondary purpose of the analysis was to gain empirical data on the relationship between the performance of rugby players and playing or team variables. One of these variables was the competition grade of a player (i.e. Senior, Senior B, Second Grade, Under 21 years and Under 19 years). The author predicted that although Senior Grade players were more experienced in rugby than Under 21 or Under 19 players, this experience would not enhance performance on the strength task or the speed task employed in the present study.

Another variable was a subject's playing position within the team categorised as back or forward. It was predicted that backs would perform better than forwards on both a strength task and a speed task. It is a general rule that backs are faster than forwards as speed is a requirement of backs, whereas with forwards strength is more important. However the strength task in the present study involved lifting one's body weight. Therefore, while forwards may be stronger than backs their strength-to-weight ratio was expected to be lower. Consequently it was predicted that backs would be superior in performance to forwards in the strength task also.

A perceived effort analysis was included to determine if subjects perceived that they gave more effort to the tasks when they mentally prepared themselves as compared to when they didn't. The same question had been asked in an earlier study (Weinberg et al, 1980).

Their results had indicated that subjects who mentally prepared themselves for performance perceived themselves as exerting more effort than subjects in a control condition.

2.5 Hypotheses

Four hypotheses were investigated. The first was derived from research supporting the Trait Anxiety Theory (Spielberger, 1966) and from research on the effects of mental preparation on motor performance. The second and third hypotheses were derived from the experimenter's observations and experience in playing rugby, and the fourth hypothesis was derived from research investigating the amount of effort a person perceived himself to exert under mental preparation (Weinberg et al., 1980).

Hypothesis 1: That in both tasks, subjects with low and moderate levels of trait anxiety will perform significantly better in the experimental condition than in the control condition, but subjects high in trait anxiety will perform significantly worse in the experimental condition than in the control condition.

Hypothesis 2: That a subject's playing grade will not differentially effect performance.

Hypothesis 3: That backs will perform significantly better than forwards on both tasks.

Hypothesis 4: That subjects will rate their perceived effort exerted as higher in the experimental condition than in the control condition.

CHAPTER 3

METHOD

3.1 Subjects

One hundred and eighty-four male volunteers were administered the Sport Competition Anxiety Test (SCAT) (Martens, 1977). SCAT is a trait anxiety scale designed for measuring a predisposition to respond with varying levels of state anxiety in competitive sports situations. The SCAT was constructed primarily for research purposes to identify subjects varying in competitive trait anxiety. This particular trait anxiety test was used as it is designed specifically to measure competitive trait anxiety rather than general trait anxiety, and is therefore more suited to anxiety research in the area of sport. The test has also been shown to have high construct validity (Martens, 1977; Martens & Simon, 1979) and to be a better predictor of behaviour than some other trait anxiety measures (Martens & Simon, 1979).

The subjects were 184 volunteers, all of whom were at the time of the study playing rugby in one of eleven teams. These eleven teams comprised five Senior Grade teams, two Senior B Grade teams, one Under 21 team and three Under 19 teams. The eleven teams came from six different rugby clubs in Christchurch city. The age range of the subjects was 18 to 37 years. Three players declined to complete the anxiety test.

Of the 184 subjects, 54 were later selected at random to partake in the experimental stage of the study. Three subjects withdrew

from this stage of the study as injuries sustained while playing rugby left them incapable of performing the experimental tasks. As these withdrawals occurred during the initial stage of experimentation the three subjects were replaced by other subjects from the initial group of 184 who completed the SCAT.

Towards the latter stage of the study three subjects had to be dropped as it proved impossible to arrange suitable times for them to perform in their second experimental task. Constraints of time and the unavailability of replacement subjects proved substitution to be untenable. These three subjects were then dropped from the analysis.

3.2 Design

The design of the present study involved a number of comparisons of mental preparation with trait anxiety level, playing position and grade, with repeated measures on the mental preparation variable.

This then gave three additional independent variables which were analyzed successively with mental preparation.

1) Subject's trait anxiety level as measured by the Sport Competition Anxiety Test (Martens, 1977).

2) Subject's playing position as a forward or a back as indicated on their SCAT form.

3) Subject's playing grade as Senior, Senior B, Under 21 or Under 19 as indicated on their SCAT form.

The four dependent variables were:

1) Experimental group and control group rope climbing performance as measured by latency scores.

2) Experimental group and control group running performance as measured by latency scores.

3) Experimental group and control group perceived effort exerted as measured by responses to a post-experimental questionnaire.

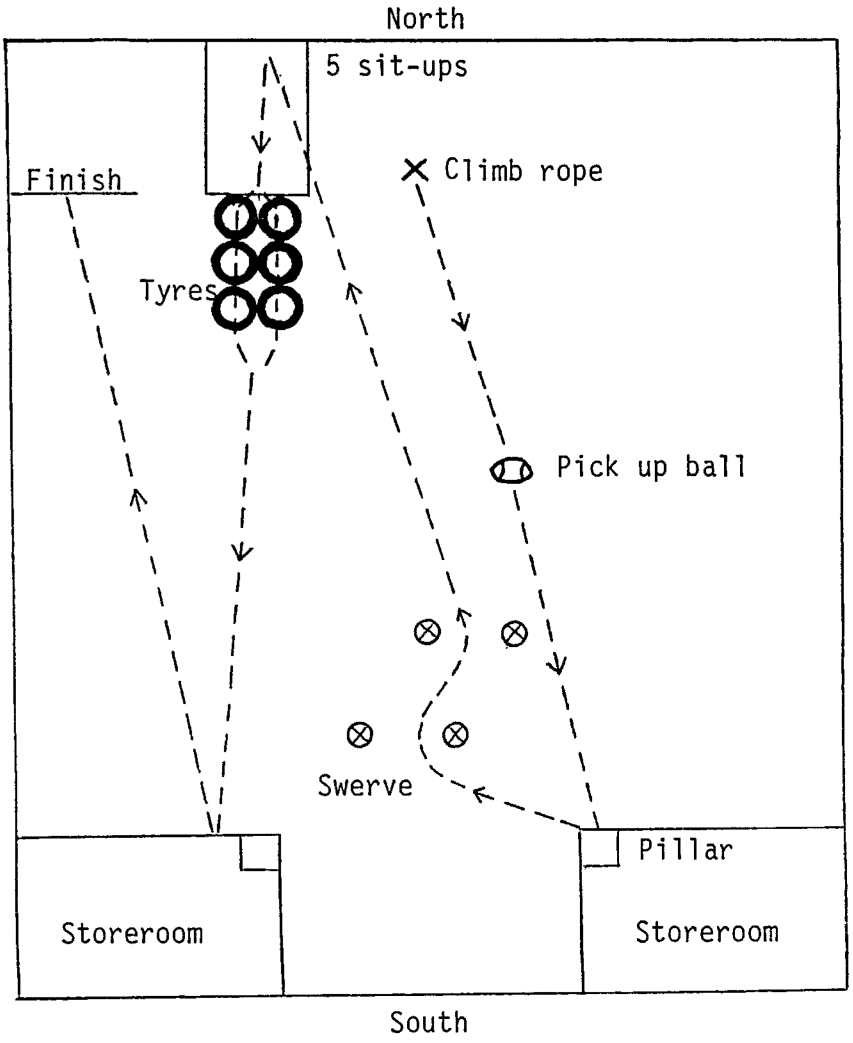
4) Estimated amount of time spent mentally preparing by the experimental group as measured by response to a post-experimental questionnaire. With this dependent variable a one-way analysis of variance was employed.

3.3 Tasks

The tasks consisted of climbing a rope to a point 5.8 metres above the floor, and back down again, and then running four lengths of a gym through a specified course - a distance of 62 metres (See Figure 1). To the author's knowledge no such tasks have been used in research in sports psychology.

The rope climb was designed to measure dynamic strength relative to body weight. A dynamic strength task, as opposed to a static strength task (e.g. a hand dynamometer), was chosen for this study as this is the type of strength required in playing rugby. Subjects were required to climb the rope to a point 5.8 metres from the floor,

Figure 1: Floor Plan of Experimental Tasks



Note:

The subject climbed the rope at "x", then ran to the south end of the gymnasium and touched a pillar, picking up a rugby ball on the way. He then negotiated the markers and ran north to the mat, dropping the ball after passing through the markers. Five sit-ups were performed on the mat and then a foot was placed in the hole created by each tyre. The subject then ran south, touched the wall and then ran north to a finishing line.

and back down again. Performance was measured by a stopwatch. Timing commenced when the experimenter said "go", and finished when the subject's feet again touched the floor after climbing the rope to the required height. If the subject was unable to reach the required height on the rope within 30 seconds it was assumed that further time would not aid performance, and he was told to come down and proceed directly into the running task. He was then given a latency score of 30.

The running task requiring speed, endurance and co-ordination was designed to try and incorporate some of the skills needed in rugby as well as those necessary for outright speed and endurance (See Figure 1). It consisted of running from the base of the rope used on the rope task to the opposite end of a gym and picking up a rugby ball at a midpoint; touching the wall, turning, swerving through some markers and running to the end of the gym; doing five sit-ups on a gym mat; turning and running through six tyres lying flat on the ground placing a foot in each; then running to the end of the gym, turning and sprinting to a specified finishing mark. Performance was measured by means of a stopwatch in seconds, taken from when the subject's feet touched the floor after the rope climb until they reached the finishing line. For both tasks, subjects' times were recorded to the nearest tenth of a second.

3.4 Procedure

The SCAT was administered to each subject either before his rugby practice or in his clubrooms after a game.

The tests were scored using a standard scoring procedure which could give resultant scores varying from 10 (low trait anxiety) to 30 (high trait anxiety). From the 184 subject scores, low, medium and high trait anxiety groups were selected. Subjects eligible for the low anxiety group had scores below the 20th percentile which corresponded to a test score of between 11 and 19. The medium anxiety group subjects were selected using scores in the 40th to 60th percentile which corresponded to test scores in the range of 22 to 24, while the high anxiety group had scores above the 80th percentile corresponding to a test score of between 26 and 30.

Each anxiety group had 36 potential subjects based on their percentile scores. Fifty percent, or 18 subjects from each anxiety group were then randomly selected for the experimental stage of the study giving an overall total of 54 subjects.

Subjects were tested twice during a 43-day period between 28th June and 9th August. Tests were conducted between 5pm and 6pm on a Tuesday and a Thursday evening. Generally, testing occurred before subjects' rugby practices. On two occasions tests were performed between 10am and 1pm on a Sunday.

The number of days between a subject's first test and their second test was designed to be at least 21 days to avoid learning effects. However, constraints of time and the unavailability of subjects as the season drew to a close necessitated that a 3 week interval between each subject's testing days was not always possible.

As a result, 39.2 percent of subjects did not have three weeks between testing days, although only 9.8 percent of subjects had less than a 2 week interim.

Each subject served as his own control, i.e. he was tested twice; once in a mental preparation condition and once in a control condition. The mental preparation condition consisted of the subject mentally preparing himself for 30 seconds prior to performance, using any technique he desired. The control condition required the subject to count backwards in sevens from a 3 digit number. The order in which subjects performed in each of the two conditions was counter-balanced.

All subjects received standard task directions. Upon entering the gym to perform the experiment subjects were informed that they were required to undergo a "timed performance task." Subjects were then given motivational instructions. Subjects were told,

> "You will be competing against 50 other people, some from your own club, some from your own team, and some from different clubs. A similar task to the one I'm going to get you to do has been shown to be a good predictor of general athletic ability. I've adapted it slightly to include some of the skills you will encounter in a game of rugby, so I expect this task to be a good predictor of rugby ability also".

Subjects were then informed of the task requirements. The procedure and instructions for both tasks were as follows:

"When I say 'go' I want you to climb this rope until one hand touches the red mark".

The red mark was a piece of electrical tape located on the rope 5.8 metres above the floor. The experimenter made sure the subject could see the mark.

The subject was told,

"Come down again and as soon as you hit the floor run off down here, pick up the rugby ball and then touch one hand to this pillar. If you miss the ball on the first go, don't worry about it, keep going. You'll get a slight time penalty, but keep going".

The threat of a time penalty for failure to pick up the ball successfully was included to ensure that subjects tried their utmost to pick the ball up. The experimenter ran through the route to demonstrate the course. The subject was told,

"Then go straight across and swerve through the markers. As soon as you're through the markers you can drop the ball or throw it away. Run down to the gym mat and do five sit-ups, hands behind your head, head to your knee. Get up, through the tyres, a foot in each, down to the end, touch the wall and back through to this mark".

The experimenter ran through the markers then down to the gym mat where he performed one sit-up, and then ran through the tyres placing a foot in each tyre to demonstrate what was required. The tyres were six in number, lying flat on the floor, 2 abreast in 3 rows (See Figure 1). The experimenter pointed to the south end of

the gym then showed the subject the chalk mark he was to finish at. After the task was explained subjects were asked if they understood what was required, and were prompted to recount the task instructions in order to enable the investigator to assess if subjects knew what was needed of them and to further enhance subjects' memory of the task.

Subjects were then given one of two sets of instructions explaining the experimental or control conditions. If the subject was performing the task in the experimental condition he was told,

> "I am going to give you 30 seconds to psych yourself up for this task; that is I want you to mentally prepare yourself for maximum performance. Use any technique you feel comfortable with. When 30 seconds is up I will say '30 seconds is up', and then 'ready, go' and you will start to climb the rope."

Although the term "psych-up" is not a strict psychological term, it was used in the experimental instructions as the investigator felt that this term is more commonly used by players and coaches to refer to the process of 'mental preparation'. Therefore "psych-up" would more readily convey what was required.

Each subject was told to position himself below the rope and then to commence his mental preparation. After the 30 seconds mental preparation the experimenter said "go" and the subject started climbing the rope.

The control condition was designed to impose a standard distraction task. The instructions for the control condition were as follows,

"I want you to count backwards in sevens, out loud, from the number 911 for 30 seconds."

Subjects often queried the experimenter at this point and the instructions were explained again if required. The experimenter continued,

"When 30 seconds is up I'll say '30 seconds is up' and then 'ready, go', and you will start to climb the rope."

As in the experimental condition, each subject positioned himself below the rope, was told to commence counting, and when 30 seconds had elapsed was told to begin climbing the rope.

In other studies employing a counting control condition (Shelton & Mahoney, 1978; Weinberg et al., 1980) subjects counted backwards from a 4-digit number. However, when a 4-digit number was used in a pilot study some subjects found the task extremely difficult. Some became embarrassed and extremely frustrated at their inability to count backwards correctly. As counting backwards is designed to be a cognitive distraction task rather than a stress inducing task, it was decided to reduce the number of digits to three. During experimentation the counting task was satisfactorily performed by all subjects and did not appear to cause undue stress.

3.5 Questionnaire

After each subject completed an experimental task he was required to answer one of two questionnaires. If the subject had just performed the experiment under the control condition they answered only one question which was,

1. How much effort did you exert (as a percentage)?

If they had undertaken the experimental task in the mental preparation condition the items were,

1. Describe the psych-up technique you used.
2. How many seconds of the 30 did you spend psyching-up?
3. How much effort did you exert (as a percentage)?

CHAPTER 4

RESULTS

4.1 Statistical Analysis

4.1.1 SCAT scores

The SCAT scores and their frequencies for the 184 subjects are reported in Table 1. The possible range of scores was from 10 (low trait anxiety) to 30 (high trait anxiety). The range of SCAT scores for the sample group was 11 to 30, with a median score of 22.

Table 1 : SCAT score frequencies

Score	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Frequency	0	1	1	2	1	5	8	7	3	11	15	18	21	15	13	14	15	15	9	7	3

4.1.2 Performance scores

Analyses of variance were performed using the BMDP2V statistical package for the Social Sciences. The rope performance experimental and control group scores were analyzed by a two way analysis of variance of mental preparation successively across trait anxiety level, playing position, the grade of the team the subject played for, and order.

The analysis was employed to test Hypothesis 1: that there would be a mental preparation x trait anxiety level interaction in rope performance. Specifically, that mental preparation would result in relative increments in performance for low and medium trait anxious subjects but would result in relative decrements in performance for high trait anxious subjects. This hypothesis was partially supported as results showed an interaction effect between the mental preparation condition and trait anxiety level, $F(2, 48) = 3.47$, $p < .03$ (See Table 2, Figure 2). Further analyses of this result revealed that there was a significant performance difference between the experimental and control group scores in the high trait anxiety group, $t(16) = 2.585$, $p < .02$, but not in the low trait anxiety group, $t(16) = 0.14$, NS or the medium trait anxiety group, $t(16) = 1.07$, NS (See Table 3). One way analyses of variance of both the experimental rope scores and the control rope scores across trait anxiety level revealed no significant differences.

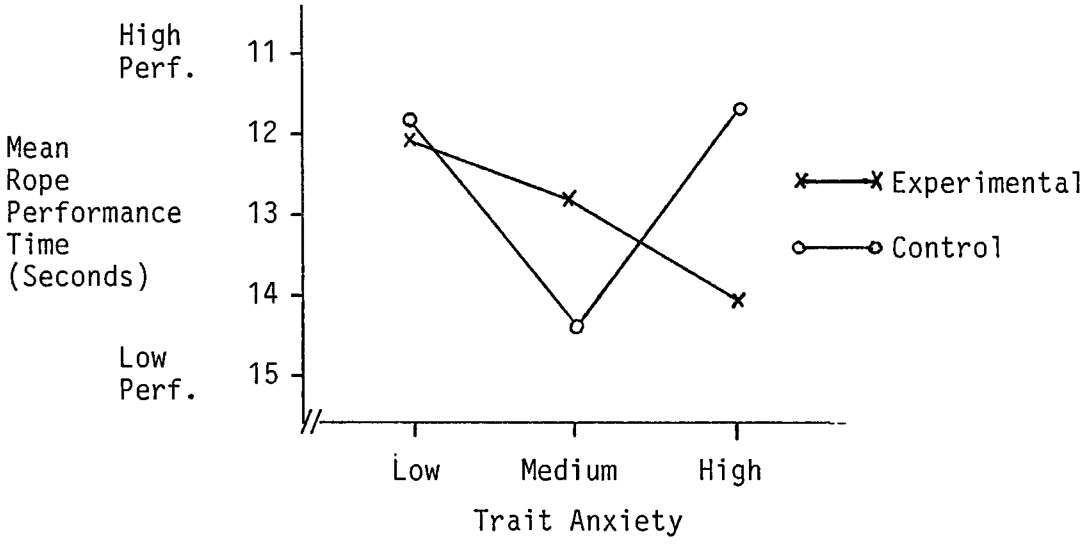
An analysis of variance of the experimental and control group performance scores for the running task was performed successively across trait anxiety level, playing position, playing grade and order. The results did not support Hypothesis 1. However significant running performance main effects appeared over trait anxiety level, $F(1, 48) = 13.87$, $p < .0005$, position, $F(1, 49) = 13.52$, $p < .0006$, grade, $F(1, 45) = 15.8$[1], $p < .0003$, and order, $F(1, 49) = 14.61$, $p < .0004$. Further analyses were performed on the trait anxiety

1. In the grade analyses the Second Grade Category was dropped as the sample size (N=2) was too small.

Table 2 : Summary of the analyses of variance of the effects of mental preparation and anxiety on the performance of motor tasks.

Task	Source	df	MS	F	Sign.
Rope climb	Anxiety	2	16.36539	0.44	N.S.
	Error (S/ANX.)	48	37.44652		
	Mental Prep.	1	4.61657	0.80	N.S.
	M x A	2	19.95069	3.47	<.0393
	Error (S/M.P.)	48	5.75598		
Running	Anxiety	2	0.0419	0.01	N.S.
	Error (S/ANX.)	48	7.0683		
	Mental Prep.	1	8.3592	13.87	<.0005
	M x A	2	0.8852	1.46	N.S.
	Error (S/M.P.)	48	0.6026		

Figure 2 : Graph of means of rope performance over anxiety levels.

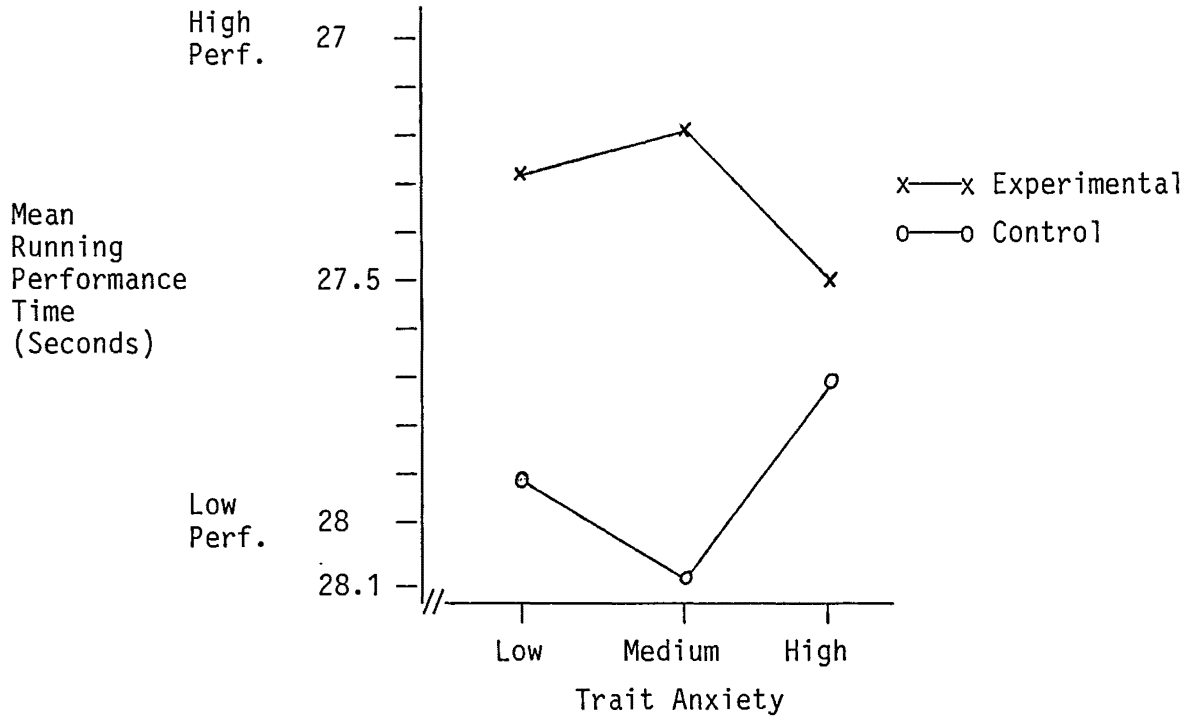


Note: All performance graphs show low latency scores (high performance) at the top of the Y axis.

Table 3: Summary of t-tests on the effect of mental preparation and anxiety on the performance of motor tasks.

Task	Anxiety Group	df	t	Sign.
Rope	Low	16	0.14	N.S.
	Med.	16	1.07	N.S.
	High	16	2.585	<.02
Running	Low	16	2.266	<.05
	Med.	16	2.875	<.02
	High	16	0.263	N.S.

Figure 3: Graph of means of running performance over anxiety levels.



data, revealing significant differences between mental preparation scores and control group scores in the low trait anxiety group, $\underline{t}(16) = 2.266$, $\underline{p} < .05$, the medium trait anxiety group, $\underline{t}(16) = 2.875$, $\underline{p} < .02$, but not for the high trait anxiety group, $\underline{t}(16) = 0.263$, NS, (See Table 3, Figure 3).

Further analyses of the grade data revealed significant differences in running performance between the experimental and control conditions in Seniors, $\underline{t}(21) = 2.105$, $\underline{p} < .05$, Senior B's, $\underline{t}(6) = 2.978$, $\underline{p} < .05$, but not for Under 21 or Under 19 grade subjects (See Table 4).

Table 4 : Summary of t-tests on the effect of mental preparation and grade on the performance of the running task.

Task	Grade	df	t	sign
Running	Senior	21	2.105	< .05
	Senior B	6	2.978	< .05
	Under 21	5	2.423	N.S.
	Under 19	13	1.184	N.S.

4.1.3 Players' grade

Hypothesis 2 which postulated that there would be no significant differences in performance between grades was only partially supported. Results showed no significant grade main effects for the rope performance data, $F(3, 45) = 1.87$, NS. A grade main effect was revealed however for the running performance data, $F(3, 45) = 2.86$, $p < .04$ (See Table 5). To further test the main effect, analyses of variance were performed between each paired combination of grades. Results showed Under 21 grade subjects running performance to be significantly better than Senior subjects $F(1, 26) = 3.96$, $p < .05$, and Under 19 subjects $F(1, 18) = 9.9$, $p < .005$ (See Table 6, Figures 4 & 5). There were no other significant differences.

4.1.4 Players' position

The third hypothesis, that backs would perform significantly better than forwards on both tasks, was supported in the analysis. Backs performed significantly better than forwards in both the rope task, $F(1, 49) = 7.84$, $p < .007$, and the running task, $F(1, 49) = 10.44$, $p < .002$ (See Table 7, Figures 6 & 7).

Table 5: Summary of analyses of variance of the effects of mental preparation and grade on the performance of motor tasks.

Task	Source	df	MS	F	Sign
Rope	Grade	3	60.49893	1.87	N.S.
	Error (S/G)	45	32.36461		
	Mental Prep.	1	0.27639	0.05	N.S.
	M x G	3	7.51921	1.25	N.S.
	Error (S/M.P.)	45	6.00110		
Running	Grade	3	15.9828	2.86	<.04
	Error (S/G)	45	5.5933		
	Mental Prep.	1	10.0092	15.8	<.0003
	M x G	3	0.5757	0.91	N.S.
	Error (S/M.P.)	45	0.6334		

Table 6: Summary of analyses of variance showing the grade main effects of mental preparation among pairs of grades on the performance of motor tasks.

Running Task								
Grade	Senior		Senior B		Under 21		Under 19	
	F	Sign	F	Sign	F	Sign	F	Sign
Senior	-	-	-	-	-	-	-	-
Senior B	0.16	N.S.	-	-	-	-	-	-
Under 21	3.96	<.05	3.97	<.04	-	-	-	-
Under 19	1.10	N.S.	2.35	N.S.	9.9	<.005	-	-

Figure 4: Graph of means of rope performance and grade.

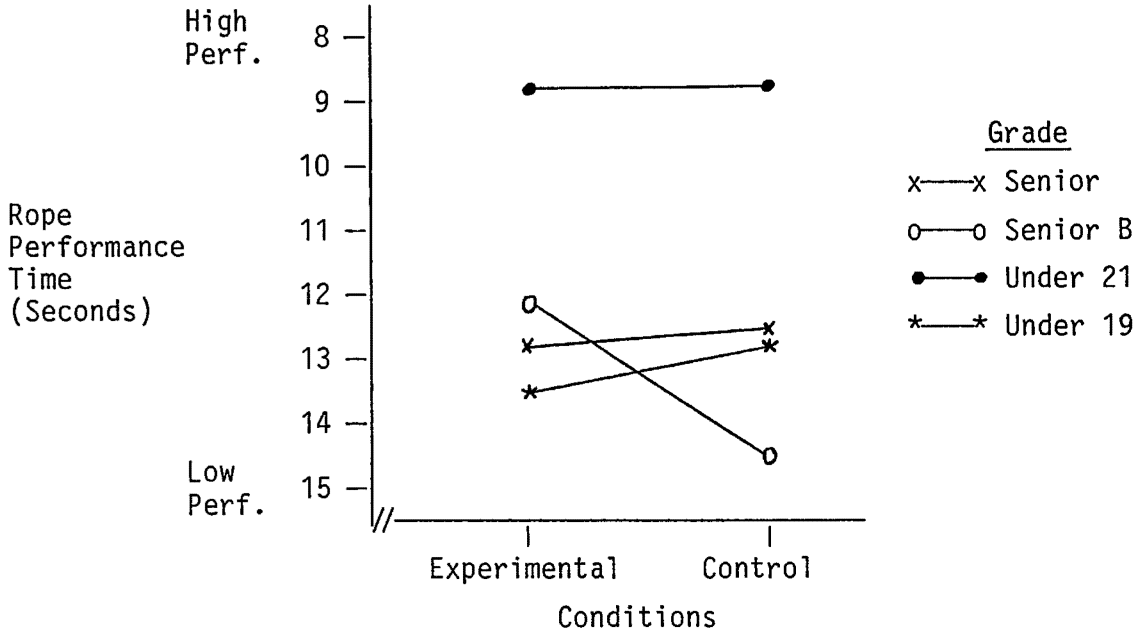


Figure 5: Graph of means of running performance and grade.

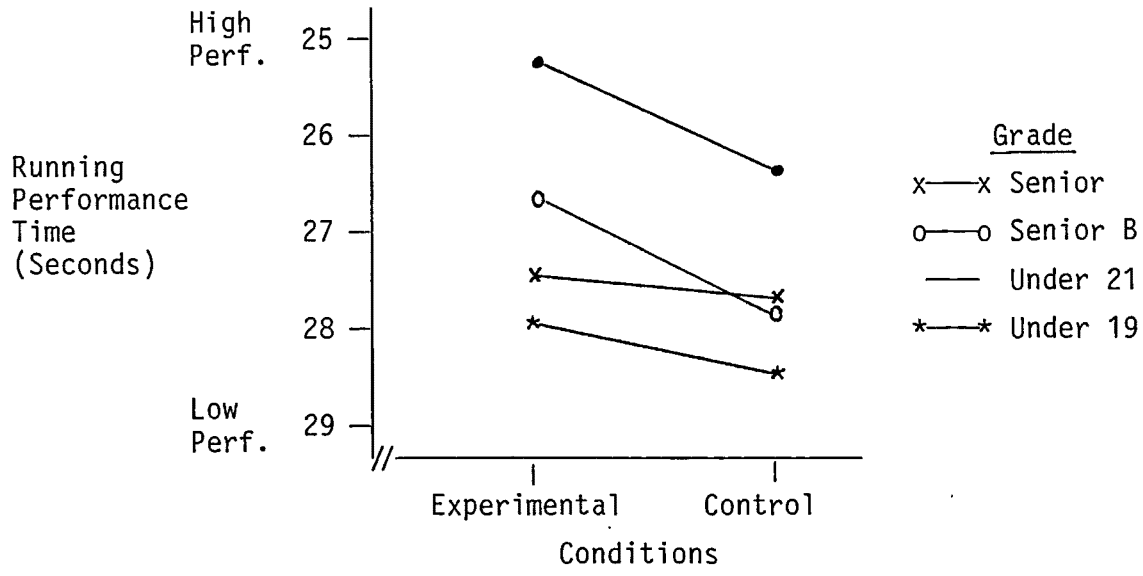


Table 7: Summary of analyses of variance of the effects of mental preparation and position on the performance of motor tasks.

Task	Source	df	MS	F	Sign
Rope	Position	1	252.38323	7.84	< .0073
	Error (S/P)	49	32.19960		
	Mental Prep.	1	4.48659	0.70	N.S.
	M x P	1	2.34855	0.37	N.S.
	Error (S/M.P.)	49	6.40490		
Running	Position	1	59.604	10.44	<.002
	Error (S/P)	49	5.7094		
	Mental Prep.	1	8.2572	13.52	< .0006
	M x P	1	0.7643	1.25	N.S.
	Error (S/M.P.)	49	0.6108		

Figure 6: Graph of means of running performance and position.

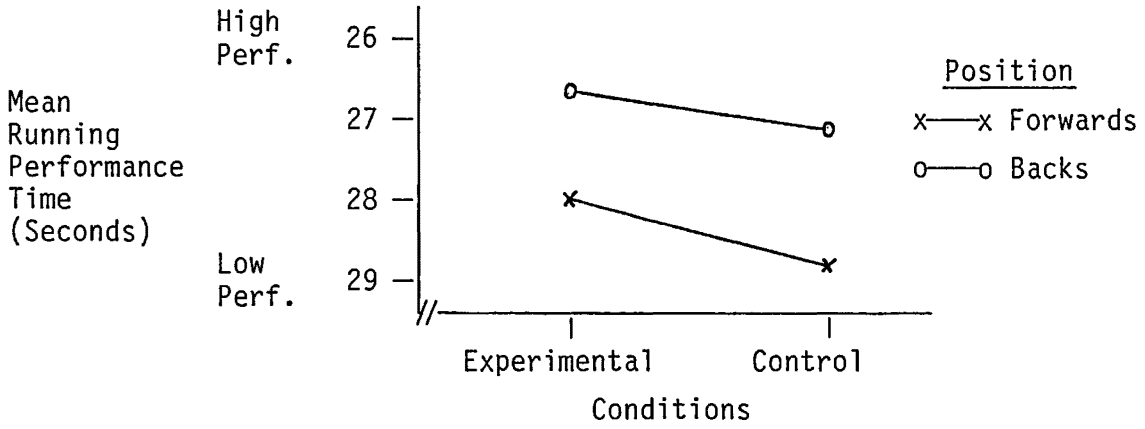
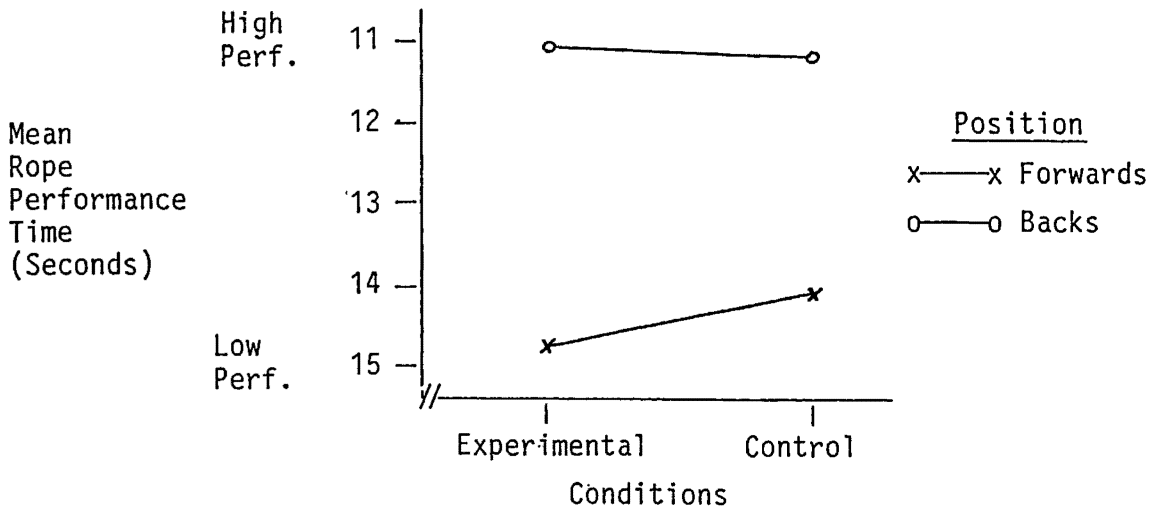


Figure 7: Graph of means of rope performance and position.



4.1.5 Perceived effort

The amount of perceived effort exerted by subjects in the mental preparation condition and the control condition were analysed across trait anxiety, position, grade and order by an analysis of variance. The results supported Hypothesis 4 which postulated that significantly more perceived effort would be exerted in the experimental condition than in the control condition. The analysis showec significant effort main effects over anxiety, $F(1, 48) = 6.07$, p .001, position, $F(1, 49) = 5.90$, p .01, grade, $F(1, 45) = 16.49$, p .CC02, and order, $F(1, 49) = 6.70$, p .01 (See Table 8).

4.1.6 Percentage time spent mentally preparing

To determine if the percentage of time spent mentally preparing had any effect on performance, the percentage of times spent preparing were divided into four groups: 0-25%, 26-50%, 51-75%, 76-100%, and subjects experimental performance scores were entered in the appropriate column and then averaged. A visual inspection of these means showed only minor variations, and therefore statistical analyses were not undertaken (See Table 9, Figure 8).

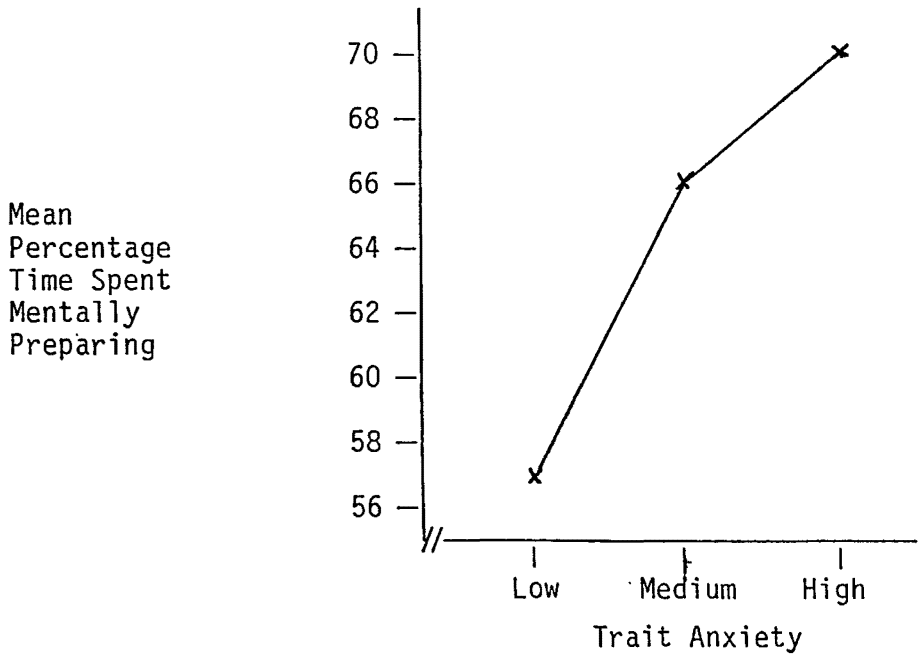
Table 8: Summary of analysis of variance of the effects of mental preparation, and anxiety, position, order and grade on the amount of perceived effort exerted.

Source	df	MS	F	Sign
Anxiety	2	27.72304	0.2	N.S.
Error	48	140.46630		
Mental Prep.	1	174.72794	6.07	<.01
M x A	2	33.36029	1.16	N.S.
Error	48	28.78493		
Position	1	172.77285	1.28	N.S.
Error	49	135.20522		
Mental Prep.	1	172.77077	5.90	<.01
M x P	1	14.82764	0.51	N.S.
Effort	49	29.25652		
Order	1	54.12994	0.39	N.S.
Error	49	137.62650		
Mental Prep.	1	187.83360	6.70	<.01
M x O	1	75.06893	2.68	N.S.
Error	49	28.02710		
Grade	3	58.86576	0.42	N.S.
Error	45	138.57199		
Mental Prep.	1	396.96366	16.49	<.0002
M x G	3	84.02779	3.49	<.02
Effort	45	24.07819		

Table 9: Summary of means of experimental performance scores and percentage time spent mentally preparing.

	Percentage Time Spent Mentally Preparing			
	0-25	26-50	51-75	76-100
Rope Task	14.46	12.25	12.01	14.27
	13.36		13.14	
Running Task	27.84	27.32	27.17	27.38
	27.58		27.26	

Figure 8: Graph of means of percentages of time spent mentally preparing over anxiety levels.



4.1.7 Order effects

Analyses of order effects were undertaken to determine if any differences in performance between the experimental and control conditions could be explained by learning effects. There were no significant order main effects over rope performance, $F(1, 49) = 0.01$, NS, running performance, $F(1, 49) = 0.21$, NS, perceived effort, $F(1, 49) = 0.39$, NS, and percentage of time spent mentally preparing $F(1, 49) = 0.05$, NS.

4.1.8 Mental preparation techniques

Responses to question 1 of the post experimental condition questionnaire were examined to determine the content of subjects' mental preparation strategies. The subjects' responses were classified and two independent raters were enlisted to assess the reliability of this classification. Since some subjects reported using more than one mental preparation technique, reliability between raters was conservatively estimated by requiring that both raters be in exact agreement on the self-reported components of each subject's mental preparation strategy. Interrater agreement for all 51 subjects was 90.2%. The subjects upon whose techniques raters did not agree, were then dropped from further analysis.

In accordance with Caudill et al. (1983) and Weinberg et al. (1980) the following mental preparation strategies were identified and the percentage of subjects who used each technique in the present study

were as follows:

1) mental rehearsal or imagery - 56.5%
2) attentional focus - 41.3%
3) preparatory arousal - 17.4%
4) relaxation - 8.7%
5) self efficacy - 7.84%.

Four of the 51 subjects responses were unclassifiable. Mental preparation was characterized by such statements as "I thought about what I had to do"; attentional focus by "I tried to concentrate on the task"; preparatory arousal by "I breathed deeply to get oxygen into my blood" and "I tried to get angry"; relaxation by "I just tried to relax"; and self efficacy by "I told myself I could do it". The percentage of subjects using more than one technique was 54.3%.

Because such a large percentage of subjects used more than one technique analyses of the effect various mental preparation strategies may have had on performance were not carried out.

CHAPTER 5

DISCUSSION

5.1 Trait Anxiety Level and Mental Preparation

There were two major results from the present study. Firstly, the effects of mental preparation and anxiety level on performance varied according to the task being performed and secondly, an individual's trait anxiety level did influence the effect mental preparation had on his performance.

That the two tasks have produced differing results can be seen clearly in Figure 2 and Figure 3. The rope performance graph (Figure 2) shows that mental preparation has had a non-facilitatory effect on performance in the low and medium trait anxiety groups in that there is no significant difference between experimental and control scores. Conversely, however, with high trait anxiety subjects, mental preparation has produced rope performance scores significantly less than scores in the control condition. In the results from the running task it is apparent that mental preparation has enhanced each group's performance relative to their control scores, significantly so in the low and medium trait anxiety groups.

If the two graphs of rope performance and running performance are then compared it can be seen that mental preparation has had a varying effect. Whereas mental preparation in the rope task did not have a facilitatory effect on performance for the low and medium

trait anxious groups, it significantly increased performance in the running task for the same two groups.

With high trait anxious subjects mental preparation in the running task did not have a significantly detrimental effect on performance as was the case in the rope task, but produced performance equal to that of the control condition. In short, in all three trait anxiety groups in the running task, mental preparation has increased performance-relative-to-control-scores above those experienced in the rope task.

The different patterns of results obtained in the rope task and the running task may well be accounted for by the fact that the tasks varied in their difficulty. A number of researchers have postulated that the arousal/performance relationship may be modified by the difficulty of the task (Fiske & Maddi, 1961; Hull, 1943; Sarason, 1961; Spence & Spence, 1966). These researchers have espoused drive theory (Hull, 1943) as a means of explaining arousal induced behaviour. The basic prediction of drive theory can be stated in the formula: Performance = Habit Strength x Drive. For complex motor skills, habit strength refers to the hierarchy of correct and incorrect responses. The theory states that arousal increases the probability of the dominant response. When an individual is initially learning a novel or complex task, incorrect responses are dominant. Increased arousal (drive) will therefore enhance the probability of these incorrect responses resulting in a decrease in performance. However, once the task is well learned and the dominant responses are mainly correct, increases in arousal should enhance performance.

Thus drive theory predicts that a higher drive level will facilitate performance of a simple or well learned skill, but that performance on a complex or novel task will be inhibited.

There is also research evidence suggesting that a difficult task differentially effects the performance of low and high trait anxiety individuals (Griffith, Steel & Vaccaro, 1979; Montague, 1953; Ramond, 1953; Taylor & Spence, 1952). These findings add to those of drive theory as specifically this research suggests that highly anxious individuals perform worse than low anxious individuals on a complex or difficult task.

Of the two tasks employed in the present study the rope task was the more difficult. This can be gauged by the fact that four subjects failed to complete the rope climb on at least one trial, whereas all subjects successfully completed the running task. The rope climb was also difficult in that it was a task relatively unfamiliar to most subjects; climbing a rope is not an exercise encountered often in rugby training. However, the sprinting back and forth in the running task, and the interspersed tasks such as picking up a ball on the run, and performing sit-ups, are exercises which would be familiar to any rugby player.

In light of the fact that the rope task was considered difficult, drive theory would predict that the higher an individual's arousal on this task the poorer his performance. Thus, a subject's performance under mental preparation would be expected to be worse than that in the control condition, as arousal in the mental preparation condition

would be higher due to the anxiety produced by cognitive rehearsal. On the other hand, because the running task was considered simple or involving a well learned skill, mental preparation should improve performance, as drive theory predicts that the higher the arousal in an easy task the better the performance.

The rope task results generally support this prediction as high trait anxiety individuals' performance is significantly worse under mental preparation. Low and medium trait anxiety individuals' performance, although not worse when they mentally prepared, shows no significant difference from control performance. The running task results also support the drive theory explanation as mental preparations effect of heightening arousal increased performance above control for all groups, significantly so in the case of the low and medium trait anxiety subjects.

The extra difficulty imposed by the rope task seems then a plausible explanation for the different pattern of results between the two exercises. The difficulty of the rope task increased subjects' arousal levels above those experienced in the running task, thus causing experimental performance generally to be worse than control performance.

However a shortcoming of this explanation pertaining to the present study and, indeed, a shortcoming of drive theory as a whole, is that it fails to account for individual differences. Therefore drive theory falls short of explaining fully the results of the

present study, in that it does not clarify how differences in trait anxiety among subjects can differentially effect the influence of mental preparation on performance.

This point leads on to the discussion of Spielberger's theory and Hypothesis 1: that trait anxiety level will differentially effect task performance. Spielberger's theory predicts that high trait anxiety individuals should exhibit higher arousal reactions to an evaluative situation than should low trait anxiety individuals. The prediction is specifically that high trait anxiety subjects will perform worse in a stressful situation than in one in which they are not stressed. In the present study, Spielberger's theory would predict that the heightened arousal induced by the difficulty of the rope task, when coupled with the arousal produced by mental preparation, would leave high trait anxiety subjects so highly aroused that their performance would suffer accordingly. The results of high trait anxiety subjects' performance on the rope task supported Spielberger's theory and Hypothesis 1: that high trait anxiety subjects would perform better with lower arousal, as the results showed that their climbing performance was significantly better in the control condition than in the mental preparation condition.

Conversely, Spielberger's theory predicts that low and medium trait anxiety subjects perform better in a stressful situation than in one in which they are not stressed. The arousal induced by the unfamiliarity or difficulty of the rope task, coupled with mental preparation, would be expected to increase arousal to a facilitatory

level, the predicted result being that low and medium trait anxiety subjects would perform significantly better on the rope task under mental preparation than under control conditions. The results on the rope task did not support this prediction or Hypothesis 1 as there were no significant differences between the experimental and control scores for both the low and medium trait anxiety groups. However, it must be noted that low and medium trait anxiety subjects' performance under mental preparation was not significantly worse than control performance as had been the case for the high trait anxiety group. Therefore it can be argued that mental preparation for low and medium trait anxiety people on a difficult task is not detrimental to performance, as is the case for high trait anxiety individuals.

The rope task results suggest that arousal induced by the difficulty of the task, when coupled with arousal produced by mental preparation and a subject's own trait anxiety level, may have left high trait anxiety subjects over-aroused. The phenomenum of over-arousal and its effect on a subject's performance has been investigated by many researchers, the first being Yerkes & Dodson (1908). They suggested that for a given task an individual has an optimal level of arousal. When this optimal level is reached, performance will be at its highest. However if arousal is greater than this level, performance will decrease. In the present study mental preparation did not improve performance for any of the anxiety groups on the rope task as it may have brought the subjects' arousal to levels above their optimum. This could account for the particularly marked

detrimental effect mental preparation had on the rope task performance of high trait anxiety subjects.

The running task however, as stated previously, produced a different set of results. Hypothesis 1 and Spielberger's theory were partially supported. The prediction that low and medium trait anxiety subjects would perform significantly better in the mental preparation condition than in the control condition was upheld by the results. However the theoretical and hypothesized predictions that high trait anxiety individuals' performance would be significantly worse with mental preparation was not supported by the data.

An explanation of the running task results may be that the task was not a difficult or unfamiliar exercise. For this reason subjects in all anxiety groups were probably not as highly aroused as they were for the rope task. It appears therefore that the nature of the running task allowed mental preparation to have its desired effect by not over-arousing subjects to a point where performance deteriorated due to excess anxiety, as appears to have been the case in the rope task.

Although the results partially support Spielberger's Trait Anxiety Theory, they are somewhat contrary to previous mental preparation research cited earlier (Shelton & Mahoney, 1978; Weinberg et al., 1980, 1981). These researchers discovered that cognitive preparation significantly improved strength performance. Therefore their findings do not agree with the present study's rope task results which indicated strength performance was not improved by mental

preparation.

A possible explanation for these seemingly inconsistent findings resides in the nature of the task. Although all previous studies with positive findings employed tasks involving strength, the hand dynamometer used by Shelton & Mahoney (1978) and Weinberg et al., (1980), and the Cybex Orthotron used by Weinberg et al., (1981) differ from the rope task in the present study in many cognitive, perceptual and motor components. The rope task could be classified as 'dynamic' in that it required motive force from the body as a whole, and also a sustained physical effort. The dynamometer and leg press tasks were more 'static' strength measures as the movement was isolated to one particular limb of the body while other areas remained relatively stationary. The length of time effort was needed in the static tasks and the dynamic task of the present study was also different. The static tasks required a quick burst of effort, rather than the sustained exertion required in climbing the rope.

However, the positive effects of mental preparation on two of the three anxiety groups in the running task is consistent with findings by Caudill et al., (1983), who also found speed/sprinting was enhanced by cognitive preparation. These findings provide some experimental evidence to support the commonly held belief that mental preparation can improve motor performance which involves sprinting.

5.2 Players' Grade

As stated in Hypothesis 2, a player's grade was not expected to effect performance. That is, it was predicted that Senior Grade, Senior B, Under 21 and Under 19 players would all perform equally

on both tasks. The results indicated no difference in performance on the rope task but found that in the running task Under 21 grade subjects performed significantly better than Senior and Under 19 players. This result implies that Under 21 players had more speed on average than the other two grades. However the sample size of six under 21 grade players is too small to allow any conclusions to be drawn from the results.

5.3 Players' Position

It was postulated in Hypothesis 3 that backs would perform significantly better than forwards on both the rope task and the running task, and this prediction was borne out in the results.

Rugby teams select backs on the basis of possession of a number of attributes, two major ones being co-ordinatory skills and speed. The skills needed for playing rugby involve agility, and hand-to-eye co-ordination which is needed for ball handling. Speed involves both acceleration and velocity, two characteristics essential in backs. Alternatively, forwards are generally employed in rugby teams for their strength and weight rather than speed, and on the basis of possession of skills associated with jumping, rucking, mauling and scrummaging rather than their ball handling ability.

Consequently, backs generally possess more speed and ball skills than forwards, and were therefore expected to perform significantly better than forwards in the running task, a task which required speed and ball skills for a high performance outcome.

However, as mentioned above, a forward's strength is generally superior to that of a back. This is because as a rule forwards are larger in size, and the strength of an athlete increases in proportion to the second power of his height (Astrand & Rodahl, 1970). Despite this fact, the ability to lift one's own body weight is not in the same proportions. In fact the heavier person is likely to have a lower strength to weight ratio and will therefore have more difficulty lifting his own weight (Astrand & Rodahl, 1970), as an increase in size does not mean there will be a concomitant increase in strength. Consequently a larger, stronger forward will have more difficulty climbing a rope than a back because backs will be stronger in proportion to their body weight.

5.4 Perceived Effort

The results supported hypothesis 4 which predicted that subjects would perceive that they exerted more effort when they mentally prepared themselves than when they did not. This finding supports the results of Weinberg, Gould and Jackson (1980), who also found that subjects in a "psych-up" condition perceived themselves as exerting more effort on a strength task than had subjects in a control condition.

This effect is not surprising as the ultimate outcome of mental preparation is to increase the effort exerted and consequently heighten performance. It is therefore likely that those who mentally prepared will perceive themselves as having exerted more effort than when they undertook no cognitive arousal. However as demonstrated by this study an increase in effort, perceived or actual, does not necessarily mean performance will increase accordingly.

5.5 Percentage of Time Spent Mentally Preparing

The post-experimental questionnaire asked subjects to estimate the percentage of the time allotted for mental preparation that they actually spent mentally preparing. This analysis was included to gain some preliminary data on whether the length of time the subject perceived he had spent in mental preparation had any influence on subsequent performance. Earlier research investigating the effects of a varying mental preparation interval (Weinberg et al., 1981) had found that the time spent in cognitive preparation had no effect on subsequent strength performance.

An initial visual inspection of the mean times spent mentally preparing in each anxiety group revealed only minor variations. Further simple analyses were conducted to indicate whether the length of time spent in mental preparation had effected performance on either task. Subjects were categorized into one of four groups according to their indicated percentage mental preparation time. The four groups were:-

1) 0 - 25 percent
2) 26 - 50 percent
3) 51 - 75 percent
4) 76 - 100 percent.

The mean of each of the four groups was then computed for both the rope task and the running task (Table 9). Visual inspections of both preliminary sets of data revealed no major differences between group means and therefore statistical analyses were not undertaken.

5.6 Mental Preparation Techniques

The most popular mental preparation techniques used by the 51 subjects were imagery (56.5%), attentional focus (41.3%) and preparatory arousal (17.4%), with relaxation and self-efficacy being employed by only a small number of subjects.

Previous research in this area is limited to six experiments by three researchers (Caudill et al., 1983; Shelton & Mahoney, 1978; Weinberg et al., 1980).

Although the above researchers' findings and the results of the present study agree on attentional focus as a popular technique, the similarity between results ends there. Imagery, rated highest in the present study, was used by a maximum of 25% of subjects in any of the three studies cited above.

Another difference was the fact that while self-efficacy was used by only 7.84% of subjects in this study, in previous works the range of percentages was from 16 - 35. So, while there is agreement that attentional focus is a well-liked preparatory technique, it appears the popularity of other techniques varies over experimental populations.

The reason for the discrepancies in results between studies may well be due to the differing types of subjects employed. The subjects used in previous research varied from weight lifters to hurdlers to students, as compared to rugby players in the present research. The preparatory techniques which may have become popular in one sporting

discipline will undoubtedly not be those encouraged in another. For example, a weightlifter's experiences and coaching in preparatory techniques is likely to differ markedly from those of a rugby player for the simple reason that certain strategies may be differentially emphasised in different sports. Also, each individual and group will have different positive or negative experiences with certain techniques which will either encourage or discourage them from using those strategies they have experimented with. In this way some sportsmen may be using a particular technique because they know of no other alternative.

5.7 Field Observations

In an attempt to supplement the empirical data from the present study some observations of rugby teams mentally preparing themselves for competition games were also undertaken.

Over a period of three weeks four teams were observed:

1) one Under 19 team
2) one Under 21 team
3) one Senior B team
4) one Senior team.

The experimenter was a current member of a Senior rugby side and so had some experience of the mental preparation which was undertaken by his Senior team. However, there is little opportunity to observe objectively when actively involved in the mental preparation oneself. Because of this, the observation of the Senior team was undertaken on a day when the experimenter was acting as a reserve player.

The general format of the teams' preparation was as follows:

1) The players and coaches arrived at the ground or clubrooms 45 minutes to 1 hour before the game.

2) The players sat down in the changing sheds and talked and joked among themselves.

3) The coach told everyone to be quiet and to concentrate on the game ahead.

   At this point the Under 19 and Under 21 coaches spoke to the players, stressing the importance of the match and what the team must do to win it. After this talk, the players started changing into their rugby attire and applying supportive strapping. The coaches then moved among the players, speaking to each one in turn about their task in the game ahead. For the Senior and Senior B teams the initial talk by the coaches was non-existant with the players proceeding firstly to get changed and the coach talking to each as he did so.

4) When changed and ready (usually 10-15 minutes before the start of the game) the coach told the players to sit down and listen. The coach again talked about the game, stressing the roles of individual players.

5) With five minutes to the start of the game the coaches left the room, and left the final task of team mental preparation to the captain.

6) At this point, events varied according to captains and teams. The Under 19 and Under 21 captains talked quietly but forcefully to the players while they stood in a tight circle jogging on the spot. Players were shaking limbs to loosen them, breathing deeply and stretching muscles, as well as indulging in their own individual mental preparation.

The Senior B and Senior teams however had a more collective preparation, with the captains telling players to play well. Examples of phrases used were "Come on guys, let's get stuck in to these fellows", and "Let's go out there and 'steam roll' them."

With approximately two minutes to the start of the game the Senior and Senior B sides proceeded, on orders from the captain, to vigourously high-knee raise while counting each knee raise aloud. This produced a concerted loud, punctuated chant by the players, as well as the din created by the action of their metal sprigged boots on the concrete floor. These types of rhythmic collective chants are used by teams to "fire up" players by using the preparatory arousal technique. That is, it is designed to increase heart rate, blood flow and adrenalin flow in order to prepare for the physical encounter the players are about to experience.

The relative merits of these two different approaches to mental preparation is very difficult to assess without a separate study being undertaken. The only available research evidence in this area is by

Gould et al., (1980), who found that preparatory arousal was consistently better than attentional focus, imagery, rest and counting backwards in increasing students' performance on a leg strength task. Therefore there is some evidence supporting the commonly held belief in rugby circles that this type of vigorous team preparatory arousal does increase performance.

However, it is dangerous to generalise the effects of a particular preparatory technique in one sporting code to that of another. As was noted earlier mental preparation strategies employed by sportsmen vary over sports' populations. It is also equally conceivable that the effects of similar arousal techniques will vary according to the environment they are used in, and other extraneous influences such as game criticality and the motivational abilities of the coach and captain.

5.8 Future Research

The point made about the effects of similar strategies on the performance of differing populations leads to the discussion of future research. This is one area which needs empirical attention in order to provide experimental evidence on which preparatory strategy yields best performance increments, and in which sports and motor activities these increases are achieved. Replication of the present study's findings and other researchers' experiments is also in need as empirical evidence in the area of mental preparation and its effects on motor performance is scant.

However, it is essential that researchers do not distance themselves from the real world and become laboratory orientated. The applicability of any findings in the field of mental preparation is ultimately in the sports arena. Therefore it is important that research is of a field nature, using sportsmen as subjects, and ideally testing them in the performance of their own sporting code. This is not to say that laboratory research is fruitless as this type of experimentation is helpful in pinpointing the processes involved and effected by cognitive arousal. But the ultimate aim is to understand motivational arousal in order to increase the performance of athletes. Consequently field experimentation results would be of most benefit to sports psychology.

This point raises one of the limitations of the present study. The tasks performed by subjects in this study, although designed to approximate the skills and requirements of a game of rugby, obviously fall short of replicating the conditions experienced in a game situation. However an effort was made to supplement the experimental design by some field observations. As noted earlier, in this way the present study was kept in perspective, as these observations give some grounds for generalising the results to the real sports world.

In retrospect the present study could have been expanded by including a measure of state anxiety before each experimental task. In this way an objective measure could have been obtained which reflected how anxious individuals were feeling when confronted with the two different tasks. Instead then of hypothesising that the

difficulty of the rope task induced arousal above that experienced in the running task an accurate measure of the degree of this arousal difference could have been obtained.

CHAPTER 6

CONCLUSION

The present study's main conclusion is that mental preparation differentially effects the performance of low, medium and high trait anxiety subjects. This effect however is not consistent across tasks. It appears that the difficulty or unfamiliarity of the task will alter the influence mental preparation and trait anxiety level will have on that performance. If a task is difficult this will increase an individual's arousal due to the threat of failure. When this arousal level is further heightened by mental preparation and the individual's own internal trait anxiety level, performance appears to decrease below that of those who have no mental preparation. This was particularly so in the case of high trait anxiety people.

The implications for rugby players or sportsmen of all codes is that highly anxious people should not become too highly aroused by mental preparation if they are about to be involved in competition which has made them already considerably anxious. The combination of a difficult game ahead, a high trait anxiety level and a rousing team preparation may push the high trait anxiety individual to a state of over-arousal. Subsequent performance may then not be as maximal as it could be if arousal were less.

Conversely, if a task or game is seen as easy or not particularly difficult, the task will not be a major source of arousal for the individual. The results of the present study indicate that in this instance mental preparation improves performance for those with low

and medium trait anxiety levels. This finding supports the notion commonly held in rugby circles that a rousing pre match build-up will "fire players up", increase aggression, and consequently increase performance. However, the conditional rule is that a performance increase after mental preparation will only ensue when the subjects are not high in trait anxiety and the game is not a critical or difficult one.

This point leads on to consideration of the high trait anxious individuals whose performance did not improve even on a familiar task. Although their performance on the running task has risen to be equal with that of their control scores, it was not significantly increased above their non-mental preparation performance as was the case for the other anxiety groups. It appears that any task or event that a high trait anxiety person undertakes will be a source of arousal due to their anxious predisposition. Therefore self or team-induced arousal for this type of individual may well not serve any purpose. In an easy game or event however it appears as if group mental preparation would not hinder a high trait anxious player's performance. It is suggested therefore that mental preparation of a team as a unit when the game is not critical would not produce any adverse effects on high trait anxious individual's performance and would facilitate the play of low and medium trait anxious players.

The implications of this study's findings would be most beneficially utilized by coaches of individuals or teams. Although the results were generated in an experimental and artificial setting

they do show that both the task at hand and an individual's trait anxiety level can influence motor performance. Coaches should therefore be aware of their teams' trait anxiety levels. This can easily be obtained by administering the Sport Competition Anxiety Test (Martens, 1977) to each individual prior to the season's competition. This will give the coach an objective indicator of each athlete's general anxiety mood prior to competitive sport. Armed with this information the present study's findings suggest the coach should differentially approach the team or individuals' game preparation according to individual trait anxiety levels and the game criticality. If coaches are aware of these two factors they can then decide what type of approach they will take in mentally preparing their team members.

Two types of approach for preparing a rugby team for a match have been described earlier in the field observation section. One approach outlined players individually mentally preparing themselves using their own techniques while standing or jogging on the spot collectively. The other described a preparatory arousal strategy used by the captain to inspire his team in which all players performed the same mental preparation.

It could be that both these techniques can be used by the same team according to the game criticality. When the game is considered "easy", and the coach feels the team is not as aroused as it should be, then perhaps the collective preparatory arousal technique would be beneficial. In this way arousal could be heightened, and according to this study, increase low and medium trait anxious individuals'

performance while not adversely effecting the performance of high trait anxious subjects.

Conversely, if the game is perceived as critical or difficult, and the players are already sufficiently aroused by this, then perhaps individual mental preparation would be most beneficial. In this way high trait anxious individuals could be calmed down rather than made more anxious by a collective arousal technique. This may then bring the high anxious players' arousal to a level which will not inhibit subsequent performance.

However, the applicability of this study's findings and those of other researchers will be dependent to a large extent on the psychological ability of the coach. Despite the recommendations given by this study on the appropriateness of various preparatory techniques according to game criticality, the ultimate judgment of the need for a heightening or a calming of arousal must reside in the subjective perception of the team's mood by the coach and captain. The ability to ascertain the arousal level of teams and individuals will depend on the coach's perceptive ability and his experience, and therefore research results can only serve as a guideline.

As has been outlined earlier the ultimate test of any theory or research results from sports psychology will be in the performance of sportsmen. If the results of mental preparation research can be applied in a natural competitive environment in conjunction with an experienced coach's ability to adapt to environmental circumstances then maximal athletic performances should result.

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APPENDIX A : SPORT COMPETITION ANXIETY TEST (MARTENS, 1977)

SCAT — For Adults

Directions: Below are some statements about how persons feel when they compete in sports and games. Read each statement and decide if you HARDLY-EVER, or SOMETIMES, or OFTEN feel this way when you compete in sports and games. If your choice is HARDLY-EVER, blacken the square labeled A, if your choice is SOMETIMES, blacken the square labeled B, and if your choice is OFTEN, blacken the square labeled C. There are no right or wrong answers. Do not spend too much time on any one statement. Remember to choose the word that describes how you **usually** feel when competing in **sports and games.**

	Hardly-Ever	Sometimes	Often
1. Competing against others is socially enjoyable.	A ☐	B ☐	C ☐
2. Before I compete I feel uneasy.	A ☐	B ☐	C ☐
3. Before I compete I worry about not performing well.	A ☐	B ☐	C ☐
4. I am a good sportsman when I compete.	A ☐	B ☐	C ☐
5. When I compete I worry about making mistakes.	A ☐	B ☐	C ☐
6. Before I compete I am calm.	A ☐	B ☐	C ☐
7. Setting a goal is important when competing.	A ☐	B ☐	C ☐
8. Before I compete I get a queasy feeling in my stomach.	A ☐	B ☐	C ☐
9. Just before competing I notice my heart beats faster than usual.	A ☐	B ☐	C ☐
10. I like to compete in games that demand considerable physical energy.	A ☐	B ☐	C ☐
11. Before I compete I feel relaxed.	A ☐	B ☐	C ☐
12. Before I compete I am nervous.	A ☐	B ☐	C ☐
13. Team sports are more exciting than individual sports.	A ☐	B ☐	C ☐
14. I get nervous wanting to start the game.	A ☐	B ☐	C ☐
15. Before I compete I usually get up tight.	A ☐	B ☐	C ☐

Scoring SCAT

The procedure for scoring the children and adult forms are identical. For each item one of three responses is available: (a) Hardly-ever, (b) Sometimes, and (c) Often. There are ten test items which measure competitive anxiety: items 2, 3, 5, 6, 8, 9, 11, 12, 14 and 15. The other five items are extras and **are not scored**: items 1, 4, 7, 10 and 13.

To score test items 2, 3, 5, 8, 9, 12, 14 and 15, use the following key:

Hardly-ever - 1 point
Sometimes - 2 points
Often - 3 points

To score test items 6 and 11, use the following key:

Often - 1 point
Sometimes - 2 points
Hardly-ever - 3 points

The range of totaled scores on the SCAT is from 10 (low competitive sport anxiety) to 30 (high competitive sport anxiety).

At the present time there are no norms on Canadian athletes with which you can compare your athletes' scores. However if an athlete scores high, on this inventory (e.g. 25 or above) it is a good indication for you to work more closely with that individual for competitive anxiety control. You might get some good suggestions on coping with competitive anxiety from those athletes who score very low (e.g. below 15) on this inventory. How do they approach the competitive situation? What do they think about, focus on, say to themselves? Probably the best time to administer this questionnaire is during the pre-season. It will be helpful in telling you which athletes have a general predisposition to being anxious in competitive sport situations. You are then in a better position to begin preparing selected athletes to meet the upcoming competitive demands.

"From Martens (1977)."

APPENDIX B : RAW DATA

Table 1: LOW TRAIT ANXIETY SUBJECTS RAW SCORES

Subject	Rope Score		Run Score		Effort		% Time Mental Prep.	Position	Grade
	Ex.	Co.	Ex.	Co.	Ex.	Co.			
1	10.0	08.0	23.9	24.1	87	90	60	Back	Senior
2	24.3	20.4	29.9	30.2	70	80	25	Forward	2nd Grade
3	14.6	13.0	29.4	29.3	80	70	83	Back	Under 19
4	08.2	10.2	23.7	25.5	80	70	27	Forward	Under 21
5	08.6	08.4	24.8	24.7	100	100	50	Back	Senior
6	08.7	11.3	28.0	28.3	100	95	17	Forward	Under 19
7	15.4	17.6	29.8	31.2	85	85	66	Back	Senior
8	15.4	13.0	27.5	28.2	95	90	85	Forward	Under 19
9	07.2	07.8	27.0	27.7	95	100	85	Forward	Senior
10	19.0	15.4	30.2	30.4	75	75	100	Forward	Senior
11	17.8	22.6	28.3	29.1	80	80	50	Forward	Senior
12	09.6	12.0	25.6	28.6	90	90	83	Back	Senior B
13	10.0	08.8	27.2	28.0	100	100	33	Lock	Senior
14	07.9	06.6	27.3	28.6	100	100	33	Back	Under 21
15	08.6	06.8	27.6	26.7	80	95	66	Back	Senior
16	10.3	11.6	28.4	27.0	100	100	66	Back	Senior
17	10.2	10.9	26.0	26.5	100	90	66	Back	Under 19

Note: In all tables in Appendix B, E = Experimental Condition and Co. = Control Condition

Table 2: MEDIUM TRAIT ANXIETY SUBJECTS RAW SCORES

Subject	Rope Score		Run Score		Effort		% Time Mental Prep.	Position	Grade
	Ex.	Co.	Ex.	Co.	Ex.	Co.			
18	09.3	11.5	26.5	27.0	97.5	90	66	Forward	Senior
19	12.1	18.4	28.1	31.3	95	70	100	Forward	Senior
20	16.5	Fail	27.5	29.4	75	75	50	Back	Senior B
21	08.0	07.7	26.0	26.0	100	100	66	Back	Senior B
22	11.2	14.4	26.1	26.5	95	95	85	Forward	Senior B
23	12.4	11.5	29.3	29.0	100	90	60	Back	Under 19
24	19.7	Fail	29.0	32.5	100	90	100	Forward	Under 19
25	08.5	11.7	26.2	25.3	90	85	66	Back	Under 19
26	14.1	15.2	26.7	28.2	95	78	95	Back	Senior B
27	12.4	15.8	27.4	28.2	90	80	66	Back	Senior B
28	14.4	15.6	29.5	30.5	80	85	50	Forward	Under 19
29	12.6	12.0	27.5	29.8	85	85	60	Back	Under 19
30	11.8	09.0	26.2	27.4	90	75	50	Back	Under 19
31	17.8	14.0	27.0	27.1	80	90	100	Back	Senior
32	10.6	12.8	25.9	27.5	75	70	50	Forward	Senior
33	16.9	09.2	28.6	27.2	80	90	25	Forward	Senior
34	12.0	06.9	25.0	25.3	90	100	17	Back	Senior B

Table 3: HIGH TRAIT ANXIETY SUBJECTS RAW SCORES

Subject	Rope Score		Run Score		Effort		% Time Mental Prep.	Position	Grade
	Ex.	Co.	Ex.	Co.	Ex.	Co.			
35	14.4	10.4	27.7	28.4	100	80	66	Forward	Senior B
36	10.0	09.8	26.6	27.5	100	100	100	Forward	Senior
37	14.8	10.4	27.5	28.8	100	100	85	Forward	Senior
38	Fail	13.2	29.9	29.5	90	85	90	Forward	Under 19
39	05.8	06.4	24.2	25.3	90	80	85	Back	Under 21
40	16.0	16.0	27.4	29.4	80	80	100	Forward	Senior
41	16.8	12.6	29.1	29.5	80	75	33	Forward	Senior
42	09.9	11.0	27.9	28.5	80	80	100	Back	Senior
43	Fail	Fail	31.0	30.5	80	80	66	Forward	Senior
44	11.3	09.2	27.5	26.8	95	95	80	Forward	Under 19
45	10.8	10.8	26.5	27.4	90	90	66	Back	Under 19
46	13.4	11.1	24.4	25.3	95	90	85	Back	Under 21
47	10.4	11.8	27.7	28.5	80	70	0	Forward	Under 21
48	07.8	06.9	25.0	24.9	90	80	85	Back	Under 21
49	15.3	12.2	29.5	27.5	99	99	50	Back	Under 19
50	15.6	09.4	31.9	30.8	90	95	50	Forward	2nd Grade
51	07.2	07.6	23.7	23.5	100	100	66	Back	Senior